ATTACHMENT A

RPA PROVISION NUMBER 11 (From Final Biological and Conference Opinion on Lower Colorado River Operations and Maintenance - Lake Mead to the Southerly International Boundary)

11. Alternative compensation habitat. Reclamation shall take part in a long-term program of on- and off-site compensation for historical southwestern willow flycatcher habitat that is lost and is not restorable on the LCR (Lower Colorado River**) because of the effects of Reclamation's continuing operations and maintenance activities. This shall be coordinated with the rangewide evaluation called for in flycatcher short-term provision number 5, above, and with the Southwestern Willow Flycatcher Recovery Plan (in progress) and other efforts of the Southwestern Willow Flycatcher Recovery Team. The on-site compensation is additive to the requirements of provision number 5, above, and may be done in conjunction with provision number 14, below, on ecological restoration. The off-site compensation habitat, if not already used by southwestern willow flycatchers, will be managed to eliminate or sufficiently reduce the factors limiting to the species. By January 1, 1999, Reclamation shall present a plan to the MSCP (Multi-species Conservation Planning effort) for funding and implementation of the long-term program, e.g., through acquisition, easements, partnerships, ecological restoration, etc., with the goal of initiating implementation by May 15, 2001. Alternative off-site compensation approached that may be developed through the MSCP, that are aimed at achieving the same goals, could satisfy this provision.**

This compensation represents the amount of historical southwestern willow flycatcher habitat lost or precluded from developing into suitable flycatcher habitat due to inundation, lack of flooding, widely fluctuating water levels, exotic species encroachment, water quality, soil salinity, or permanent structures because of the continuing effects of Reclamation's facilities and operations. Criteria for suitable or potential flycatcher habitat are found in the Status of the Species--Habitat Use section of this BO. Reclamation, in conjunction with flycatcher short-term provision number 5, above, on immediate habitat protection, shall immediately initiate a rangewide evaluation to identify suitable lands requiring protection for the recovery of the flycatcher; this shall be coordinated with other flycatcher recovery efforts undertaken in the future by the Service, as well as with any flycatcher conservation efforts undertaken through the MSCP. As in provision number 5, protection can occur through acquisition, easements, partnerships, ecological restoration, etc., that result in long-term preservation of the habitat from destruction and from alteration in ways that would decrease its value as flycatcher habitat.

ATTACHMENT B

LIFE HISTORY OF THE SOUTHWESTERN WILLOW FLYCATCHER (*Empidonax traillii extimus*)

Species Description and Life Requisites

The willow flycatcher is one of ten species in the genus *Empidonax* found in North America. Empidonax flycatchers are renowned for their physical similarities and, thus, for the difficulty in identifying individuals in the field (Phillips et al., 1964; Peterson, 1990; Tibbitts et al., 1994). *Empidonax trailli* is further divided taxonomically into five subspeices (US Fish and Wildlife Service, 1997). The southwestern willow flycatcher *(E. T. Extimus)* is a small bird measuring approximately 5.75 inches and weighing less than 0.5 ounces. It has a grayish-green back and wings, whitish throat, light grey-olive breast, and pale yellow body. Two white wing bars are visible. The upper mandible is dark, the lower light. The most distinguishing taxonomic characteristic is the absent or faintly visible eye ring.

The southwestern willow flycatcher is a neotropical migrant. They winter in Mexico, Central America, and possibly in northern South America (Peterson, 1990; Tibbitts et al., 1994). Southwestern willow flycatchers may begin arriving in breeding territory as early as late April and may continue to be present until August (R. McKernan, per.comm.). Migration routes are not completely known but do include drainages where breeding populations have not been documented in Arizona (US Fish and Wildlife Service, 1997). Other subspecies, including *E. T. Brewsteri and E. T. Adastus*, probably utilize identical migration corridors.

Southwestern willow flycatchers nest in riparian habitat characterized by a dense stand of intermediate sized shrubs or trees, such as willows (*Salix* sp.), *Baccharis*, buttonbush (*Cephalanthus* sp.), box elder (*Acer negundo*), or saltcedar (*Tamarix* sp.), often with an overstory of scattered larger trees, such as cottonwoods (*Populus fremontii*) or willows. They may begin nesting in late May and continue through July (Tibbitts et al., 1994; R. McKernan, per. Comm.). Typically, southwestern willow flycatchers raise one brood per year but have been documented to produce more than one brood during a seadon (Whitfield, 1990; R. McKernan per. Comm.). Brood parasitism be brown-headed cowbirds (*Molothrus ater*) has been documented throughout the range of the southwestern willow flycatcher and has been blamed for reducing flycatcher breeding success (Unitt, 1987; Brown, 1988; Rosenberg et al., 1991; Sogge and the southwestern willow flycatcher extends from extreme southern Utah and Nevada, through Arizona, New Mexico, southern California, and west Texas to extreme northern Baja California and Sonora, Mexico (Unitt, 1987).

Description of Breeding Habitat

The southwestern willow flycatcher is a riparian obligate occurring in habitats characterized by dense stands of intermediate sized vegetation, usually with water or moist soil present beneath the canopy. The Biological Opinion (US fish and Wildlife Service, 1997) has identified five general habitat types utilized by nesting southwestern willow flycatchers range wide including.

I) "monotypic, dense stands of willow (often *S. Exigua or S. Geyeriana* above 7000 feet in Arizona) 9 to 20 feet in height with no distinct overstory; difficult to penetrate; vertical foliage density uniformly high (>60%) from ground to canopy".

II) "monotypic, dense stands of saltcedar 12 to 35 feet in height forming a nearly continuous, closed canopy (i.e. no distinct overstory); vertical foliage density increases with height; canopy density uniformly high (approx. 90%); difficult to penetrate".

III) "dense stands of mostly Godding's willow 12 to 40 feet in height characterized by trees of different size classes, a distinct overstory, subcanopy strata, falen but living trees creating dense tangles difficult to penetrate"

IV) "dense mixtures of native broadleaf trees and shrubs including cottonwood, willows, box elder, ash, buttonbush, and stinging nettle, characterized by a distinct overstory of cottonwood or willow with subcanopies and a dense understory of mixed species alsodifficult to penetrate".

V) "dense mixtures of native broadleaf trees and shrubs as in number 4 above mixed with exotics such as saltcedar or Russian olive primarily in the understory; dense ground level tangles difficult to penetrate sometimes interspersed with small openings".

Other site characteristics may be important, however, most are poorly understood. Occupied habitat patch size and shape can vary significantly, with areas as small as 0.6 percent hectares being utilized (Sogge et al., 1995). It appears, however, that linear habitats only one or two trees wide do not provide suitable nesting habitat for southwestern willow flycatchers (US Fish and Wildlife Service, 1997). Other factors, including parasitism, predation, prey preferences and abundance, abiotic conditions (e.g. temperature, humidity) and population dynamics (e.g. site fidelity, distribution of breeding populations, dispersal, demography) are not fully understood and may affect breeding success along the lower Colorado River. Studies are ongoing in an effort to further quantify habitat quality.

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Dear Mr. Swett,

The following comments are in response to the letter LC-2312, ENV-7.00 and regard the Reasonable and Prudent Alternative (RPA) #11; compensation of historical southwestern willow flycatcher habitat.

A. Data sources:

The use of explorers journals, photos, maps, and flow data is a reasonable approach. I am not familiar with journal accounts cited in the letter from Mr. Michael Walker (LC-2312, ENV-7.00); however, his list seems to be lacking reference to many of the biological surveys conducted in the western U.S. in the late 1800s and early 1900s (e.g., Merriam 1890; Ridgeway, 1914; Swarth 1929, to name a few). Many biological surveys were conducted in the west during this period, often as a component to geological surveys, and are likely to have covered parts of your project area on the Lower Colorado River. I suggest a thorough review of the government and academic publications of this period to identify all possible historical data sources.

B. Proposed methods:

Two of the three assumptions are potentially problematic. I agree with assumption (1); historical flows probably were highly dynamic and habitat type and extent probably varied greatly through time. Assumption (2) states that in the two years following the construction of Hoover Dam, there was not a significant influence on the extent or composition of downstream habitat. It is difficult to support this assumption without more information regarding the construction history of the dam. Specifically, high intensity pulse-release of water during or subsequent to dam construction could have significantly altered the downstream habitat. Therefore, a thorough review of the activities during and agter dam construction is necessary to validate this assumption. Finally, assumption (3) states that the aerial photos are “typical” of the extent and composition of historical habitat. There is no way to know this from aerial photos alone; especially after considering assumption (1). How can photos representing only one or two snapshots in time be considered representative and typical if flows are highly dynamic and habitat is highly variable? The photos could depict typical or transitional states of the habitat. Furthermore, there may not be a single typical state if the system is highly dynamic and varied through time.

I realize that you must make assumptions and proceed given the best available data, and what you have presented is a good start. I recommend additional research into the historical literature regarding biological surveys, review the possible downstream impacts of Hoover Dam construction, and modification of the assumptions to incorporate explicitly the uncertainty of assumptions (2) and (3)

Thank you for the opportunity to review your sources and methods.

Sincerely

Scott Fleury
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July 5, 1998

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Dear John,

I've thought a little more about your request for historical information on the potential habitat for southwestern willow flycatcher on the lower Colorado River. If I were more mobile, I could give you more information, but unfortunately I will be largely unable to spend much time outside of my home for another month.

The National Archives lists entries number 52-54 as being Colorado River I, II, and III of Bureau of Reclamation photography at a scale of 1:20,000. The years are 1938, 1939, and 1942, respectively. Another Bureau of Reclamation project, titled Gila River Valley, has 1:20,000 photography from 1939. In addition, there are SCS photographs of the Hualapai Indian Reservation and the Arizona Strip, which may contain some imagery below Hoover Dam, from 1936 and 1940. I suggest if you do not have any of this photography that you either contact me or the National Archive and try to obtain flight line indices.

The best suggestions regarding oblique ground photography involve the National Archives and the Arizona Historical Society in Tucson. I would wager the Stanton photography from 1890 is probably the best, and certainly the most systematic, photography of the river. I noticed in one book I happened to be going through for other reasons that a photographer by the name of Delancy Gill was taking numerous photographs in the vicinity of Yuma around the turn of the century. Because his photographs appear to document Cocopah Indians, I would suggest either the Arizona Historical Society (try the Dellanbaugh collection as well as Gill) or the Smithsonian in Washington, D.C. Otherwise, the Arizona Historical Society has numerous photographs of sternwheelers on the Colorado.

Best of luck in your search.

Yours truly,

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Dear Mr. Swett:

This is in response to the letter of April 8, 1998, signed by Michael T. Walker, requesting my review and comments on the sources and methods proposed by Bureau of Reclamation (Reclamation) for documenting the amount of historic southwestern Willow Flycatcher *(Empidonax traillii extimus)* habitat on the Lower Colorado River prior to the construction of the Hoover Dam.

My field of expertise is avian ecology, and I have had limited experience with using and interpreting aerial photography, so I will limit myself to making some general comments regarding your methods, and sharing some information I have been able to compile regarding potential additional resources and contacts that you might wish to explore.

I agree with you that, of the resources you list in your correspondence, the aerial photographs from 1930 and 1938 will provide the most substantive information. My conversations with several people who have experienced in photo-interpretation may provide some additional information. One person, who has had some experience in riparian areas in the Southwest, agreed with your assumption that the 1938 photographs would not yet show significant influences from construction of the dam in 1936. In fact, he stated that there would be minimal impact downstream from damming in the first few years, and most of that would be limited to the first half mile to mile below the dam, evidenced by some scouring and widening of the river there.

Several of my contacts noted that the time of year (season) in which the aerial photographs were taken will determine how much detail can be extracted regarding habitat types. With regard to the stereoscopic interpretation of these photos, all of my contacts agreed that you should be able to extract some information regarding tree species, height, density and canopy cover, as mentioned in the southwestern Willow Flycatcher habitat descriptions in the Biological Opinion. In fact, one person said that black and white photography is sometimes preferred for density and canopy cover measures. It was suggested that you keep the habitat categories you are trying to distinguish rather broad in recognition of the limitations imposed by the photographs. Another commented that it may be difficult to distinguish between willow and saltcedar, but this may not be as much an issue from that time period when saltcedar was not as widespread in the riparian areas. It was also suggested that, because you obviously cannot go back and ground-truth the original photography, you might analyze current aerial photography with the same photo-interpretation techniques as a check. You could then ground-truth these methods and make any adjustments to interpretation of the original photography based on these checks.

Several other sources were mentioned that, if you haven't already explored them, might provide additional historical resources. Tobin International of San Antonio, Texas, has a wide variety of historical photography, although it may be primarily more recent (from 1950's). A contact there is Anna Moy (1-800-223-6203). The USGS EROS Data Center also has a large library of aerial photographs. Their website provides information about their resources and how to order photographs. It is located at: **http://edcwww.cr.usgs.gov/eros-home.html.** The National Archives Records Administration (NARA) also has accumulated an extensive library of historical photographs. A contact there is Bill Murphy (301-713-7083); their website is located at **http://www.nara.gov**. One of my contacts did point out that searching for historical photos at NARA can be quite labor intensive. He suggested focusing on the aerial photographs you already have and then resorting to NARA if there are gaps in your information, or it doesn't meet your needs.

Finally, there are a couple of people you are welcome to contact as you proceed with the actual photo-interpretation. I assume that you are already in contact with Reclamation's remote sensing and geographic facility in Denver (contact: Michael Pucherelli, 303-236-4300), so you may not be in need of additional assistance. If you would like to speak with someone else, I would recommend two USGS contacts. Larry Handley is a geographer with our National Wetlands Research Center in Lafayette, Louisiana (313-266-8691). He has done some work on riparian areas in the Southwest. Kevin Hop is a biologist (remote sensing) with our Environmental Management Technical Center in Onalaska, Wisconsin (608-783-7550 Ext. 46). Both of these people have extensive experience in interpreting aerial photography, were very responsive to my questions, and said they would be glad to speak with you.

I hope you will find this information helpful.

Sincerely,

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